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Front Cover:

Photo by Peter Oldham
Pamela Oldham submerged in
a fresh pile of autumn leaves.

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On Gossamer Wings

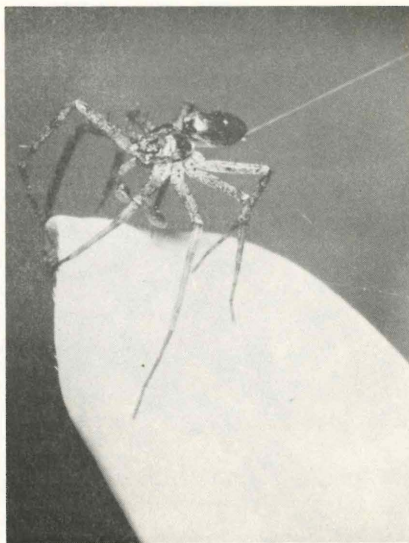
Text and photos

by Robert O. Joslin, Director

Through all my years as a naturalist, I still revel at the shimmering beauty of fallen gossamer on a dewy autumn morning. I shall never forget my first encounter with such a sight as a young lad. My father and I had been fly fishing for trout on a northern Michigan stream. With the first cast, my favorite trout fly was caught among the bushes on the opposite bank. While retrieving it, I was both amazed and intrigued by the vast array of silken fibers draped about the bushes. Each strand, moist with dew, caught the rays of the rising sun, and the glitter was dazzling. From that moment, I was determined to discover the source of this seemingly mystical beauty.

In my search for an answer, I came upon the written testimony of others that spiders could actually fly on lines of silk. During the autumn months, spiders become very active and cover the meadows and shrubbery with innumerable dragline filaments of silk which soon form a thin webbing over everything. Part of the silk strands

that I had seen on the memorable day were those put out by young spiders in unsuccessful attempts at flying. Many of these threads are often picked up by the wind and showered down in spots far away from where they originated. This floating film of spider silk on a calm, clear day is known as a gossamer.



Many years later, having acquired experience as a naturalist and wildlife photographer, I embarked upon the task of recording the life histories of several species of spiders.

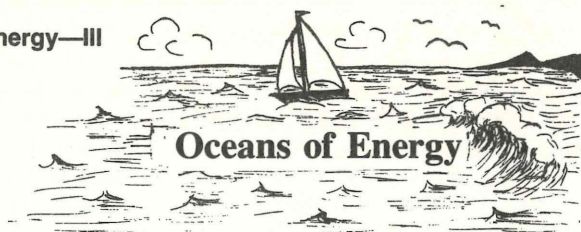
One family of spiders, Lycosidae, caught my attention right from the start. These were the powerful hunting spiders who were able to run down their prey, in a fashion similar to that of wolves. The female wolf spider carries her white egg sac attached to the spinnerets located beneath her abdomen. She will guard her progeny-to-be fiercely. Having hatched and emerged from the egg sac, the young spiderlings will clamber onto her back and ride with her for a week or more. During that time, the spiderlings never feed. If a little one falls off, it quickly scrambles back up via the nearest leg. I have personally observed the female wolf spider stop at the edge of a rain puddle to allow the spiderlings to crawl down her legs for a drink.

Soon, with their next molt, the spiderlings will leave the protection of their mother. At this point in their lives, the spiderlings become can-

nibalistic and will devour each other. Now nature has decreed, through in-born instincts, for their distribution on gossamer wings. This would be a moment during the lives of these spiders that I would want to capture on film.

One windy October morning, I was to receive my opportunity at recording this spider-flying event. I had been photographing a large female wolf spider with young. She had climbed nearly to the top of a waving stem of timothy grass. This seemed a most curious thing for her to do. For now, both she and spiderlings were being wafted about on the moving stem. One by one, the tiny spiderlings came down her legs and took a position facing into the wind at the very tip of the stem. This was the moment that I had waited for! Each spiderling released a long strand of breeze-catching silk and waited for a strong gust to carry him aloft. I watched, with astonishment, as they rose in the sky above me on wings of silk. Brought back to childhood memory, I remembered the aerial attempts by spiderlings on that eventful fly-fishing morning.





The seas are the heart's blood of the earth. Plucked up and kneaded by the sun and the moon, the tides are systole and diastole of earth's veins. The rhythm of waves beats in the sea like a pulse in living flesh. It is pure force, forever embodying itself in a succession of water shapes which vanish on its passing.

Henry Beston, *The Outermost House*

by Catherine Kashanski

We in New England can well understand and appreciate the words of Henry Beston as the ocean with its beauty and strength, recreational uses, and food sources is an important part of many of our lives. It may become even more vital to us in the not-so-far future if present research and demonstrations show that the seas can be utilized economically to produce electricity. The potential of this neglected energy source is great and "it will only be as long as it takes to wake up the minds of men in government and industry. It's inevitable. There's no way we can avoid using energy from the ocean. The ocean will one day be a major source of energy," according to J. Hilbert Anderson, president of Sea Solar Power, Inc. This article will discuss several of the possible ways the tremendous energy of the seas can be extracted, what is involved in developing the extraction process, and the present status of these energy sources.

Ocean Thermal Energy

One of the most promising ways now being intensively studied and seriously considered is the use of ocean thermal differences to generate electricity. Two nine-month study contracts were given by the National Science Foundation in July, 1974, to

study the feasibility of utilizing the temperature differences of the ocean layers for electrical generation. One study submitted to the Energy Research and Development Agency in the spring of this year pronounced ocean thermal energy technically feasible and with sufficient funding (around a billion dollars) there could be "some 20,000 megawatts of installed generating capacity . . . provided by 1990." For comparison, this amount is close to that now being supplied by nuclear plants.

The principle behind the functioning of an ocean thermal power plant is relatively simple. The heat of the warm surface layer of water would be used to evaporate a liquid with a low boiling point, such as ammonia. The vapor would turn a turbine attached to the generator which then produces the electricity. Cold water piped up from several thousand feet would condense the liquid so it is ready to be used again. The plant itself would consist of a 17-story floating concrete structure having a pipe about 4000 feet in length and 50 feet in diameter that would reach down to the cold bottom waters.

The electricity produced by these plants could be used in several different ways. One way would use it to

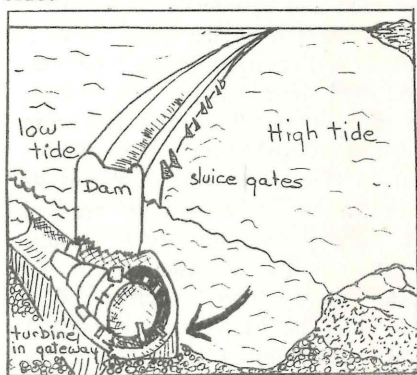
separate the hydrogen from oxygen in water molecules (electrolysis), liquefy the hydrogen, and have it transported to existing power plants. A second way would produce hydrogen gas and use that to make ammonia. The liquid ammonia brought to shore would supplement the short supply now available for food production. The ocean plant could also supply inexpensive electricity to aluminum refineries where the electricity is a vital element in the production of aluminum. Or, coal shipped to the ocean plant and hydrogen from electrolyzing water could be combined to create a hydrocarbon fuel that would replace petroleum. Whatever option is selected, ocean thermal power can be an influential sector of our future energy sources when and if it receives the attention and funding it deserves.

Tidal Power

Another source of power that could make an exciting and significant contribution in providing electricity is that of the tides. Any good French student knows about the tremendous tidal range in the Bay of Mont St. Michel, just as any good New Englander has heard of the long-talked-about plans for Passamaquoddy in the Bay of Fundy. Now, due to the continually rising costs of fuel, the plans of many years for these two sites may become a reality.

At the present time there is only one commercially-operating tidal power plant, and this is the one across the La Rance estuary in Brittany, France. In order for this or any tidal plant to work, there has to be a minimum difference between water levels of 16 feet. (The one in Brittany has a range up to 37 feet.) Though there are some variations, the basic idea behind the functioning of the plant is the same. As the tide comes in and water flows through gates of a

dam, the level behind the dam builds up. At peak high tide the gates are shut and the water with its potential energy is trapped behind the dam. At peak low tide, when there exists the greatest difference between the two levels, the gates are opened and the water rushes through, its force turning the turbines in the gateways. The problems arise in devising a system that would store the water and release it at times of peak electrical demand rather than having the power generate at the times of maximum high and low tides: the two don't usually coincide.



One way to get around this problem is to create some sort of storage system. In the Bay of Fundy project, several storage basins behind the dam are being planned; and with these, the timing of the water release could be controlled. This system adds cost to the already fairly expensive power plant itself, though. The plant at La Rance is built so the turbines can be turned no matter which way the water is flowing: from the Atlantic to the estuary or vice versa. This plant is considered successful and is producing around 500 megawatt-hours of electricity a year. Though this plant was, and new plants will be, expensive to construct (the Bay of Fundy project is estimated at between \$2-3 billion) there are several factors that

make them a wise investment. One advantage is the obvious fact that the fuel is free and inexhaustible and therefore "inflation proof." Another is that the tidal plants would have a life of 60 years or more compared to the 30-35 year life of fossil-fueled and nuclear plants. The life is longer due to the slower revolution rate of the turbines: some 200 rpm in tidal plants compared to 3,600 rpm in the others.

The Bay of Fundy project, though mainly a Canadian venture, is of great importance to New Englanders as much of the electricity produced may come to us. Much attention, off and on throughout the years, has been focused on this project because of its unique characteristic of being in the place which has the greatest rise and fall in tides, a difference of as much as 53 feet. Up until recently, large capital costs and some technological difficulties have prevented the development of this project. Now, however, according to an article in the November 9, 1974 issue of *Business Week* called "Tidal Power May Now Make Sense," the premiers of Nova Scotia and New Brunswick are once again considering plans for a plant at Fundy. With the success of the French tidal plant as an example and the growing need for alternative energy sources, now seems an opportune time to get the project off the paper and into the water.

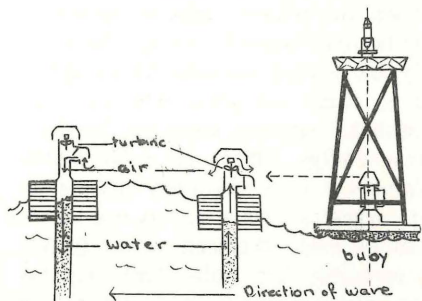
Wave Energy

Another source of energy from the sea that could in time be a fairly significant source is that of wave motion. Though the amount of energy extracted from short waves is of a much smaller magnitude than that of long waves or tides, there are purposes for which the low energy production is well-suited.

The Research and Development Center of the Coast Guard is inves-

tigating the possibility of using a wave energy system on their buoys. This and other alternative sources of energy are being researched and considered as part of an attempt to find a substitute for the heavy and expensive batteries now being used. The criteria for this alternative, as stated in a paper done by Warren Colburn and David Motherway of the Coast Guard R and D Center, is that it "requires little or no maintenance, be nonpolluting, have a six-year life expectancy or longer, and cost less than the present source." At the present time, about \$2 million a year is spent on the batteries.

The Coast Guard has been testing a wave-activated turbine generator buoy system purchased from the Japanese. It was first tried in the waters off the Virginia coast where the average power of 5.75 watts was generated for three-month periods. This system was moved up to Boston to see the results in a different area. The type of turbine generator being worked with is called the air turbine: the Japanese have about 200 of these generators on their buoys which they have been using successfully for 8-10 years, according to Wayne Becker of the R and D Center. This turbine makes use of the same principle the Coast Guard has used previously with their whistle buoys. There is a cylinder filled with air extending down from the buoy,



and as a wave goes by, water rises in the cylinder compressing the air. The air is forced past the turbine, thus turning it, and the electricity generated is stored in a battery.

Different physical characteristics of the waves have been looked at in the process of searching for the most efficient and economical way to use wave energy. Four of these characteristics are change of surface slope, vertical motion, kinetic energy of orbital motion and the changing pressure field under the wave. One of the problems that has to be faced in designing a wave energy system is that it has to work efficiently in normal weather conditions yet has to be able to withstand rough water and strong winds. Luckily, the power of the waves is so great that the durability which may reduce the efficiency of the system can be built in. An example illustrating the power of a "rather typical North Atlantic wave" is that a wave with a height of 6 feet and period of 7 seconds has an intrinsic power equal to 19 horsepower or extractable power of about half that amount *per foot* along the crest.

With knowledge of the power contained in the movement of waves, the question of why we aren't tapping this energy source comes up. Some of the reasons that wave energy has not been more developed for high energy production are that it is not a constant, reliable source, the energy is not concentrated, and the places where there exists the greatest amount of energy are not the ones where it can be feasibly harnessed. Despite these problems, there are some who have an optimistic opinion about the future of wave energy. Dr. S. H. Salter of the University of Edinburgh has a plan for large-scale wave energy use that is initially being financed by the British government. Dr. Salter feels that his generators could be producing power

commercially in 10 to 15 years. This high energy production effort follows Salter's belief that "wave power is clean, safe, permanent, and uses relatively simple, well-known technology." If this is the case, then certainly this alternative is lacking its share of attention and financing by our Energy Research and Development Agency.

Considering the tremendous potential of all three of these ocean energy sources, they have been neglected too long. It seems unreasonable that with the ocean occupying almost 75% of the earth's surface, this area of energy development has been overlooked and bypassed for too long in favor of non-renewable resources. The power of the ocean in its different forms is vast, inexhaustible and a truly clean source. It is only a matter of time and money now before the great potential of our seas is realized.

For further information the following magazines & articles are recommended:

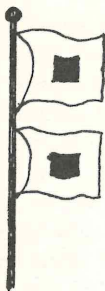
U.S. News & World Report, Jan. 27, 1975.

Popular Science, May, 1975.

Science News, May 17, 1975.

"Coast Guard Evaluation of the Wave Activated Turbine Generator (WATG) Buoy" presented at the Offshore Technology Conference in Dallas, Texas, Paper; OTC 2253.

Cathy Kashanski is a student in environmental sciences at the University of Wisconsin at Green Bay. She is a member of the local branch of the Peoples Action for Clean Energy (PACE) and participates in the activities of a statewide coalition of groups which are working for a nuclear moratorium Bill in Wisconsin. She was an active member of the Junior Curators at the Thames Science Center.



Will the Willy-Willies Hit? —

by Andrew Sims

It has been said that the only real hurricane is the last one you survived. Indeed, the mere mention of hurricanes usually brings forth a spontaneous discourse of personal experiences, especially if the person has survived a storm of severe damage such as the "New England" hurricane of 1938. All such recounters will insist that regardless of their eloquence, "you cannot imagine the power and force of a hurricane unless you have actually been in one."

The Indian tribes who inhabit the coastal and island areas which bound the Caribbean Sea know well the force of these great storms, and the word "hurricane" appears in one form or another in almost all of the tribal languages. In each dialect the word carries two meanings—"evil spirits or forces" and a tremendously destructive storm. It is no accident the same word represents both of these terrifying objects to primitive man.

Universal as the word hurricane is among the people of the Caribbean, this type of storm is found throughout the oceanic areas to the tropics and near tropics. In the North Pacific these storms are known as "typhoons," in the Indian Ocean "cyclones," and off Australia "Willy-Willies."

Whatever they are called, each of these storms has several common characteristics. All are formed over tropical oceans. All have surface winds in excess of 74 miles per hour which rotate counterclockwise about an "eye" of relative calm and depressed atmospheric pressure. (In the southern hemisphere the direction of rotation is clockwise.)

The hurricane does not spring full blown but evolves gradually through several stages.

Tropical disturbance—a slight disturbance usually developed aloft with little if any surface characteristics.

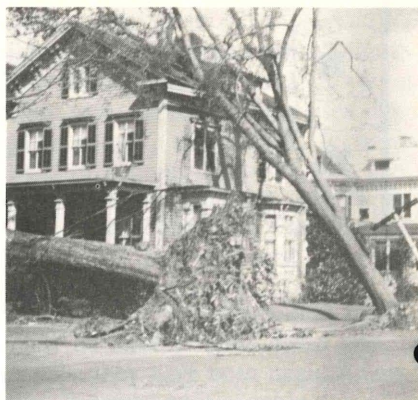
Tropical depression—a more pronounced disturbance with surface as well as aloft development. Surface winds up to 34 miles per hour.

Tropical storm—A major disturbance with surface winds between 35 and 73 miles per hour.

The development process is not uniform and a storm may develop, die down, and then redevelop. Development may be very slow initially only to have the storm intensify from a tropical depression to a full-fledged hurricane in a matter of hours.

When a hurricane does strike, its destructive power comes from several sources. Since a hurricane has winds which frequently exceed 100 miles per hour, top speeds exceeding 150 miles per hour not being uncommon, the kinetic energy of the wind has been estimated at 10^{10} kilowatt-hours or about the same as that of a hydrogen bomb. The reason the hurricane does not do more damage is because it is spread over such a large area. (Hurricanes have ranged in size from 100 to 1000 miles in diameter although the region of hurricane-force winds is usually more on the order of 50 to 200 miles in diameter.)

Another major source of direct damage from a hurricane is the heavy rainfall which is attendant. It has been estimated that a typical hurricane will deposit about 20,000,000,000 tons of water in a twenty-four-hour period. Since this tremendous rainfall extends far beyond the region of hurricane winds, it causes destruction over a much larger area through crop damage and floods. If there is a combination of high wind-driven waves, rainwater runoff and seawater flooding, spectacular flooding is produced with extremely heavy damage and loss of life. This phenomena is known as "surge," and it was this combination which caused a great deal of the Naragansett Bay damage during the 1938 hurricane.



To minimize the destruction wrought by these storms, a large amount of money and effort is expended in detecting, tracking, and forecasting them so that maximum warning can be given to those in their path. One of the latest such tools is the establishment of a weather ship manned by the U.S. Coast Guard off the coast of New Jersey. This ship will help fill in the void between the radar coverage from Cape Hatteras and that from Nantucket. With this additional information source, forecasters will now be better equipped to answer that all important question of, "How much is the storm turning east?" or "Will it hit New England?"

Since there may be more than one storm being watched at a given time, U.S. Weather Bureau forecasters have adopted the policy of assigning girls' names to storms. This is a relatively new practice begun during World War II and is not world-wide. (Australian forecasters name their storms after prominent politicians, and their forecasts are frequently tongue-in-cheek political comments.) Four lists are used for the Atlantic, four for the Western Pacific, and four for the Eastern Pacific. Each list is alphabetical with the first name starting with the letter "A". The letters Q, U, X, Y and Z are not used. Whenever a

storm causes serious damage, that name is temporarily retired from the list and another name substituted. The more severe the damage, the longer the retirement.

There has never been a year in recorded history without at least one hurricane in the North Atlantic, and the most was 21 in the year 1931. Most North Atlantic hurricanes are spawned during the months of August, September, and October. Although the storm may have been engendered further south, most North Atlantic hurricanes reach hurricane-level intensity between 11° and 30° N latitude with the greatest concentration in and east of the Leeward and Windward Islands shifting towards the northwestern Caribbean later in the season.

From their point of origin, most hurricanes gradually curve towards the north from a basically westerly path. It must be emphasized that no two hurricanes have followed the same path. This is one of the elements of their behavior which makes forecasting so difficult. (One hurricane crossed Santa Anna from the east, recurved, and came back and hit the same area again a day later, this time from the west.) Most hurricanes which reach New England brush their way up the Carolina coast before reaching us. If they go inland over this area, their power is usually dissipated and they become much less of a threat. If they pass the Carolinas too far to sea, the normal curving to the right will usually carry them completely clear of New England or perhaps they will just graze Cape Cod.

It is not by chance that hurricanes are born in the season when the water temperature is the warmest, nor that their birth occurs over the warmest portions of the oceans. It is this heated water which supplies to the air masses, through convection, the addi-

tional energy needed to convert an ordinary disturbance into one of the mightiest forces in nature. Once formed, the hurricane must continue to receive the additional energy to sustain itself. This is the reason that hurricanes tend to ride along the Carolina coast, for they are following the Gulf Stream. This does not mean that the hurricane is drawn to the Gulf Stream by any demonic mechanism but rather that those which stray away from the Gulf Stream quickly begin to diminish in intensity. Those that travel further north along the Gulf Stream before curving inland, provide the greatest potential for damage to the New England Coast. These are the "Willy-Willies" that we must beware of—keep a close weather watch!



Recommended readings:

Hurricanes, Storms, Tornadoes, James H. Winchester, G. P. Putnam's Sons, 1968. Good child's science primer.

Hurricane, Marjory Stoneman Douglas, Rinehart & Company, Inc. 1958. A look at the effect of hurricanes on history.

The Hurricane Hunters, Ivan Ray Tannehill, Dodd, Mead & Company, 1955. First-person accounts of those who fly hurricane tracking aircraft.

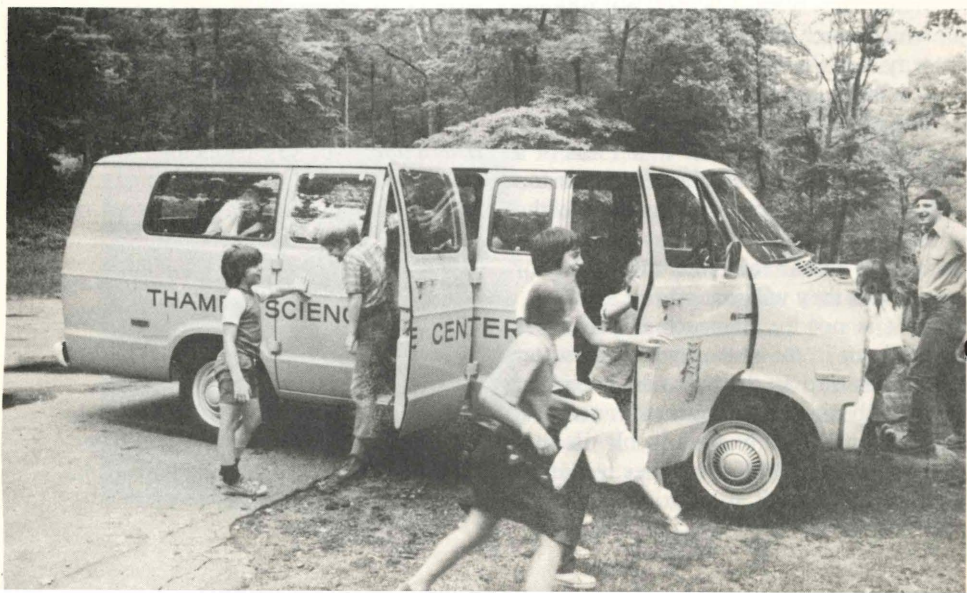
Heavy Weather Guide, Capt. Edwin T. Harding, USN, U.S. Naval Institute, 1965. Practical advice for the mariner facing hurricane weather.



THAMES SCIENCE CENTER IN MOTION

The Science Center is proud to introduce its newest addition—a brand new van. After years of need, and with the help and contributions of many, many people, the Science Center was finally in the position to purchase a new vehicle. The choice was a Dodge Maxi-wagon van, which arrived at the Center in late June. Since then, it has been put to heavy use in the Center's summer program and has proved to be the multi-use vehicle the Center needed.

The new van can be used in many ways. Its wide stance and extra length allow comfortable seating for 15 people. Large windows all the way around make riding cool and pleasant. With the seats removed, the van becomes a spacious cargo truck, capable of carrying large loads of equipment to distant sites. A rear trailer hitch enables the van to tow a large trailer for long expeditions. The van is heavy duty and designed for hard use. It should serve the Center for many years.





With the new van, the Science Center is mobile. Staff and equipment can travel to schools, parks, beaches, and other sites to serve more people. Groups of children can be transported to various locations and ecosystems. Field trips can now be offered to more distant spots. Camping trips and expeditions can now be taken anywhere in New England. The possibilities are endless. The Science Center is now truly on-the-move and able to expand its programs in many new directions.

So look for the new van. A light tan with the Science Center name and owl on both sides, it is hard to miss. It could be full of smiling children or a group of graduate students. It could be loaded with newspapers headed for recycling or carrying canoes upriver. It could be anywhere, doing almost anything. Wherever it is, in whatever program, it is helping the Science Center teach people of all ages about the world in which they live. And that is what the Science Center is all about.

by Eric Leinbach

photos by Mark McDonnell



Where Have All the Flowers Gone?

To Seed

Text and drawings

by Barbara R. Kashanski

No longer does the sun shine as intensely for it is lower in its daily arch across the sky. The hours of daylight are shorter; temperatures are cooler both day and night. The world of nature responds to these changes and prepares for the winter months ahead. Birds migrate; animals add layers of fat or hustle to store sufficient food supplies; many insects and spiders die, leaving their eggs to carry on their species in the spring; cones ripen on conifer trees while deciduous trees and shrubs lose their leaves; and flowers die, leaving only their many varied seedcases to remind the curious where they once bloomed.

If you are among the curious, I highly recommend that you take some walks during the beautiful clear bugless days of October and early November to look for interesting seedpods to decorate your home throughout the long winter months. Most outdoor enthusiasts are familiar with the plentiful and conspicuous seedcases of common non-woody plants such as the hooded gray Milkweed pods, the brown knobs left by Black-eyed Susans, skeleton umbels of Queen Anne's Lace, the brown clubbed stalks of the Cattails, and the large wavy plumes of the

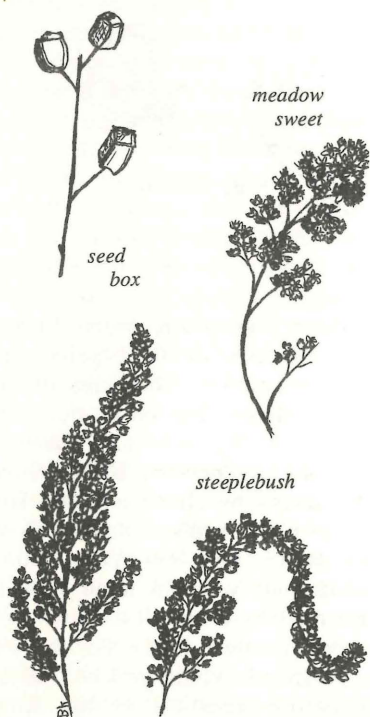
common Reed-grass (*Phragmites*). I would like to introduce you to some of the less obvious and somewhat hard-to-find seedcases that are so beautiful in their shapes, colors and patterns that, to me, the flowers seem dull in comparison.

Roadsides, fields, wet meadows and disturbed areas with poor sandy soil are good hunting grounds. The seedcases with the most unusual and intricate shapes are often small and therefore difficult to find. A good hand lens or magnifying glass will add new dimensions to your discoveries but most important is an unhurried gait and a keen eye. Considering the hundreds of species of flowering non-woody plants in southeastern Connecticut, I will only be able to mention a few. These are my favorites.

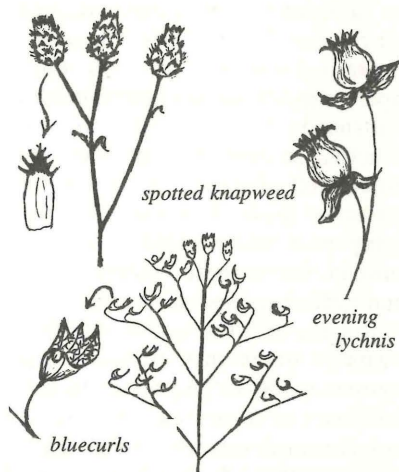
Two years ago I found for the first time the beautiful square fruits of Seed-box (*Ludwigia alternifolia*). Each small dark brown case is amazing in its symmetry—a miniature box with a tiny round hole in the top through which the seeds are shaken by the wind. The yellow flower of this 2-3 foot plant blooms during July and August in swamps or wet meadows. You'll need to look carefully to pick it out from the surrounding

vegetation, but it is well worth looking for. When a plant such as Seedbox is not abundant in an area, it is a good conservation practice not to pick all that you find. This is especially important if it is an annual and has not yet discharged its seeds which will be next year's plants.

On slightly higher and drier ground are two plants that are quite common and easy to find—Steeplebush and Meadowsweet; both of the Genus *Spiracea*. I mention these two because I use them extensively in dried flower arrangements, especially in miniatures. The delicate-looking dried flower heads make good fillers between other materials or can be used to establish a beautiful curved line (the top of Steeplebush often curves as it goes to seed). If you have means of magnification, take a look at the individual seedcase; you'll be impressed by the intricate pattern.



A not-so-common plant that can be found in old fields and pastures is the Evening Lychnis or White Campion (*Lychnis alba*). This member of the Pink family, which resembles Bouncing Bet, might attract your attention while in bloom but would probably be passed by after it has gone to seed. In my opinion, this is the time it deserves a second look. The handsome swollen seed capsule resembles a smooth shiny-brown pineapple. If collected too early in the fall, the seed-case is still covered with the calyx sac. This sac can be easily removed by peeling and beneath is the attractive shiny fruit.



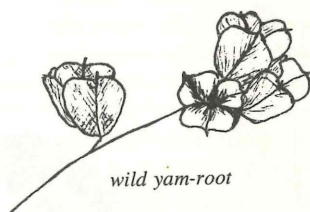
Some of the best places to prospect for interesting seedcases is under powerlines (if trespassing is permitted), in old sand and gravel pits, railroad embankments or most any area that has dry conditions and poor soil. Here you might find the many branched wiry-stemmed Spotted Knapweed. This weed is becoming increasingly abundant along many of our roadsides. The bristly capsules are pear-shaped and are most attractive if collected early in their fruiting stage. Another plant of dry open areas which has a very unusual seedcase is Bluecurls (*Trichostema dichotomum*).

I'd never even heard of such a plant until I tried tracking down the names of the seedcases I'd been collecting for several years. The name comes from the long curled blue-stalked stamens in the four-lobed flower. This plant has quite a range in height, anywhere from 4-30 inches. Most of the ones I have found have been 6-8 inches. The seedcases are like tiny little scoops—really unusual in shape and a fun addition to any collection.

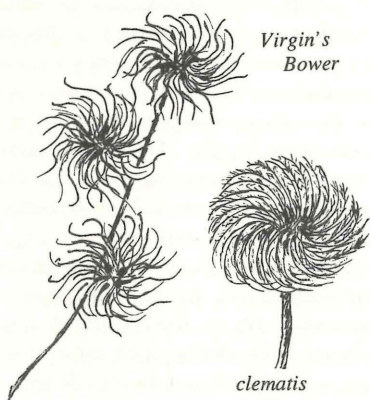
There are two vines worth mentioning—Wild Yam-root (*Dioscorea villosa*) and Virgin's Bower (*Clematis virginiana*). Wild Yam-root is uncommon and well worth looking for in shrubby wetlands. The vine can be found entwined in the tops of supporting shrubs. The light brown papery capsules are divided into three heartshaped sections. They are very attractive and stand out when in a collection of seedcases. Virgin's Bower is easier to locate. The gray plummy round seed clusters are quite conspicuous on these vines which are found along stream banks and edges of woodlands. Their gray fuzzy appearance gives this plant its other common name—"Old Man's Beard." Don't overlook the clematis in your own garden if you have some. I keep several of these fuzzy round heads in

a small vase on my kitchen window all year long and I seldom have a visitor who knows what they are, but all are impressed with their beauty. If you do collect Virgin's Bower or your own clematis, spray the heads with hair spray or clear plastic—they will last a lot longer.

I've just provided a sampling in this article, but I hope it has been enough so that you will want to go seed hunting on your own. Don't feel you have to be a flower arranger to enjoy these fall fruits. Just place them in a jar, a narrow-topped vase or an old beer bottle; their beauty will take care of the rest. And remember too, although it is fun to know the names of the plants the real enjoyment comes from just getting out-of-doors and discovering something whose design, color and texture provide all the pleasure necessary.



wild yam-root



Virgin's
Bower

clematis

(Author's note: There seems to be a noticeable lack of field guides and reference books on the fruits of herbaceous plants. The only reference I was able to find was *An Illustrated Flora of the Northern United States and Canada* by Nathaniel Lord Britton and Hon. Addison Brown, Dover Publications, Inc. New York. This is a prodigious work in three volumes but it does have beautiful drawings of flowers and their fruits. For the serious botanist it would be a helpful and interesting addition to the home library.)

Chipper's Escape



by Pauline L. Record

The day had begun quietly. Chipper, emerging sleepily from her underground home that mid-October morning, had found the only patch of sunlight on the stone wall and was crouching there in chipmunk fashion warming her back in the sun. This was her balcony, and when the sun was shining, it was a perfect place to begin the day.

The warm summer months had been play time for chipmunks. Lots of delicious food right under their hungry mouths. But with the coming of the first fall days Chipper had known instinctively that now was the time to fill the storeroom of her burrow with nuts and seeds that would feed her through the winter and the first hungry day of spring. For several weeks she had busily scoured her own territory and made occasional ventures into strange areas. Today she would go even farther afield, to the oak tree at the top of the hill to gather more of the sweet acorns she had recently discovered.

Feeling warmed and cheered by the sunshine she sprang upright for a better look around, gave a quick flit of her tail, and ran down the wall to the ground. First, for a tasty breakfast, she munched a few sunflower seeds from under the bird feeder. Then with a happy "chip-chip," she set out on her adventure. She would try to travel cautiously, staying under cover of the

tall grass and bushes as much as possible, watching alertly for emergency hiding places, and alternating long leaps forward with frequent surveys of what lay ahead.

Scurrying directly across the lawn she came to the foot of the driveway where there was a catch basin which opened into a drain she had often explored. Here she turned and followed the edge of the drive up the hill and through the long grass to the oak tree. When she reached it a gentle "chip-chipping" sound told her that another chipmunk was gathering here today, and the scrambling in the branches above meant that a squirrel was also at work. Chipper hastened to pick up two acorns which just then dropped near her twitching nose. One she ate as a reward for her successful journey, the other went into one of her pouches, followed soon by all the acorns she could hold in two pouches and one mouth. Looking like a funny, fat picture of her usual self she turned toward home, retracing her steps to her own doorway. But there she was stopped. Those bulging cheeks were too large to go through the opening which she had carefully shaped to be just her size. Dropping the acorns under the ferns by the entrance she picked up only what she could carry in her mouth and made headfirst trips back and forth until her load was all in the storeroom.

The whole day was spent in carrying food into her burrow with occasional pauses to eat some of the fruits and berries still to be found on the ground. Late in the afternoon she approached the oak tree for her last visit of the day. Widely circling the tree, she discovered a delicious scent. A few minutes of searching and snuffling brought her to a joyful discovery, a beechnut! There was no time to stop and sample, she must try to fill her pouches quickly and turn homeward before dark. She ventured on beyond the circling shade of the oak, hastily following the scent of the beechnuts and pawing in the grass until she found another and still another and finally, with a last "gulp-and-a-gollop," her mouth and cheeks were full.

Now for the homeward journey. Slipping along in the shadowy light she retraced her path—under the oak tree, through the long grass and down the hill. She had almost reached the end of the driveway when she heard behind her the sound of stealthy footsteps. Inch by inch, as she crept along, the ominous footsteps drew nearer and nearer. There was no time to race across the grass to her home. She must find a hiding place close by.

Suddenly, remembering the drain at the foot of the drive, she whirled to the right, plunged under the grating and disappeared from sight just in time to hear her pursuer clawing at the edge of the opening. An aggravated yowl told her it was probably Purr, the neighborhood cat, who thought she controlled this territory.

Chipper felt safe for the moment. The cat probably wouldn't follow her into the catch basin and the drain. She knew, too, that at the lower end of the drain pipe was a safe, brambly place into which she could escape, but beyond that there would still be about

twenty feet of space to cover before she could reach her own doorway. Dropping the beechnuts she moved cautiously ahead until a change in the air and light told her she would soon be out of the tunnel. She paused, listened, and then crept the last few inches to the opening and carefully listened again. Not a sound close by. Silently she wriggled out under a pile of brush which would protect her until she could blend herself into the shadows close to a low, short stretch of wall marking the edge of the garden. Keeping the wall between herself and the place where she had left the watchful cat, she moved closer and closer to her home.

Now there was only a short distance farther to go, but it was the dangerous part, and sounds ahead told her the cat was again on the prowl. Gathering her strength for a final spurt, Chipper moved like a streak of lightning across the grass and under the ferns, leaving the bewildered cat with only a glimpse of her tail as it seemed to fly toward her doorway. Once again Chipper had made it safely home, but the day that began so quietly in the sun had ended with a bang.

If you would like to know more about chipmunks, look for these two books in your library:

Chipmunks on the Doorstep, by Edwin Tunis. N.Y., Crowell, 1971. Lots of information and many delightful drawings.

A Chipmunk Lives Here, by Irmengarde Eberle. N.Y., Doubleday, 1966. Excellent photographs.

Pauline Record — wife and mother, has had an active career as a librarian throughout the state. She is a field trip leader for the Science Center and is our new librarian.



What Happened on Quaker Hill

by Richard H. Goodwin

map by Allen Carroll

I wonder how many people who visit the Thames Science Center and enjoy a nature walk on one of the many trails that thread the adjacent woodlands of the Connecticut Arboretum ask themselves why it is that this wild land still exists in the midst of a growing city. How can one explain the presence of the great variety of plants and animals that may still be found there today. This article will attempt to describe some of the human influences and events that have been responsible for what one sees. Documentation of the details will appear later in forthcoming bulletins of the Connecticut Arboretum.

Looking back 350 years, to a time just before white man settled the land, four Indian villages, each consisting of eight to twenty wigwams, were reported along the shores of the Thames River, where streams provided fresh water; while further up the estuary, near the present location of Fort Shantok, was a large encampment of warlike Mohegans. The Indians derived their nourishment partly from hunting and fishing, partly from cultivated crops of corn, beans and squash. An account written in 1636 of a landing on the west side of the River mentioned canoes and corn standing in the fields. It was no accident that the villages were located along the shore. Here the natives found an abundance of shellfish, as attested by the large shell heaps next to their

encampment; and Nameaug, the earliest name for New London, was the Indian word for fishing place.

The hinterland provided the hunting grounds. The Indians annually set fire to the woods to clean the underbrush and encourage forage for the deer, a practice which favored the development on the uplands of open stands of oak, hickory and chestnut—the sprout hardwoods that could survive these fires—while some of the drier, sandy sites were thus converted to grasslands.

Indian trails followed lines of least resistance through the country. One of these trails, referred to by the earliest settlers as Mohegan Path, led northward from New London to the large Mohegan encampment, heading the coves that cut into the west bank of the Thames River. Thus the first leg of this path, from Winthrop's Cove to Smith's Cove, followed the line presently occupied by Williams Street. One suspects that in Indian times it threaded open oak-chestnut forests as it passed to the west of what is now the Connecticut College campus.

This trail became a country lane servicing the farms that sprang up in what was referred to as the North Parish soon after Colonial occupation. So active were the early settlers in clearing the land that an ordinance was passed in 1659, thirteen years after the founding of the colony, forbidding the cutting of

trees within four miles of the meeting house. These early farms were laid out on either side of the lane, some of those to the east running clear to the river. The old stone walls remain as mute testimony to the diligence of these farming folk who cleared the fields of rocks, which they then used to fence in their livestock and establish their boundaries. The houses were all located close to the road, which by 1792 was established as Mohegan Road, the first operating toll road in the Country. Later it was known as the Norwich-New London Turnpike.

The two families of Thomas Bolles and James Rogers played a dominant role in the settlement of this section of New London. Their descendants formed a closely-knit community bound together by ties of matrimony and a common commitment to a religious movement founded by James Rogers' son, John, whose followers were later known as the Rogerenes. They were persecuted by the conforming members of the Colony, who referred to them as Quakers. Thus the hill on which Connecticut College is now located became known as Quaker Hill. The Rogerenes sect, which worshiped on Saturday instead of Sunday, survives today as the Seventh Day Baptists.

Thomas Bolles came to New London in 1665 and three years later purchased a cabin on the east side of Mohegan Path not far from where Deshon House of the Lyman-Allyn Museum stands today. A few years after his marriage, while he was away from home, a young delinquent entered his house and slew his wife and two older children. The youngest, John, who was still an infant, survived the massacre, and lived to populate the hill with fourteen children. Thomas and John between them acquired title to most of the land on both sides of Mohegan Path as far north as

Gallows Lane and, in addition, many lots still further north.

These holdings were divided among John's various sons. The farm just south of Gallows Lane remained in the family for six generations and was purchased by Connecticut College at the time of its founding in 1911 from Mary L. Bolles Branch, John's great-great-granddaughter. It was still under cultivation in that year. The ledges, interspersed with small wetlands on the western edge of this farm, were too rough for cultivation and remained as woodland. A fine stand of hemlock, most of which was destroyed by the 1938 hurricane, had trees which were seedlings in 1768. Hemlock, a fire-sensitive species, was certainly growing here in pre-colonial times, protected from burning by the nature of the terrain. This woodland was given to the College by Mrs. Branch's daughter, Anna Hempstead Branch, and is called Bolleswood in honor of her grandfather, John R. Bolles. The forest here and in the woodlot to the north of it was undoubtedly an important source of tree, shrub and herb seeds that have, since abandonment of the fields and pastures, actively reestablished the thickets and forest which we see today around the Thames Science Center and along its nature trail.

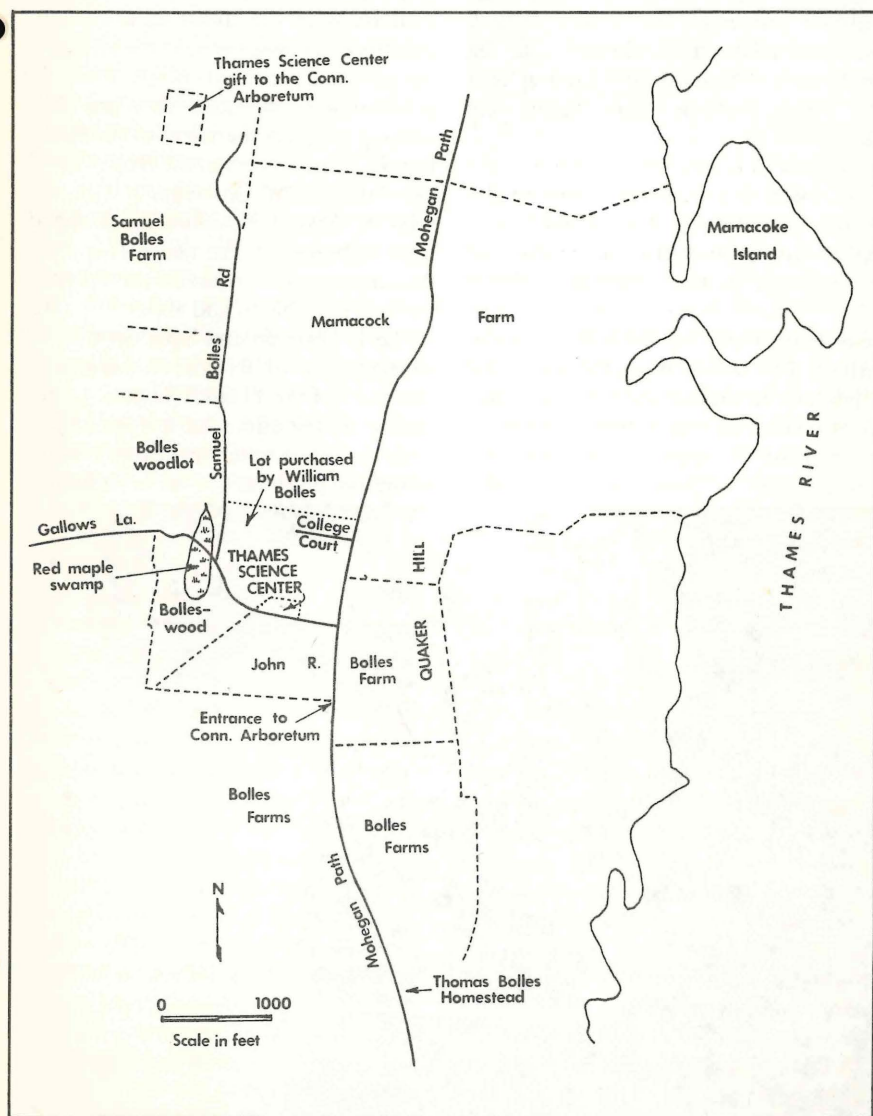
Gallows Lane is variously named in the older deeds, sometimes as Crops Road and sometimes as the highway from Norwich to Lyme. In early days it must have been a short cut between Mohegan Path and the Shore Path, which became the Shore Road leading westerly from New London. In 1753 Sarah Bramble was hanged from a gallows erected on the ledges on the Bolles property. Ten thousand people were reported to have gathered to witness the execution. Since then this road has enjoyed its present name.

John Bolles' youngest son, Samuel,

was born in 1744. At the age of nineteen he built a house on a wild and rocky road leading from New London to Norwich. This little by-way runs north from Gallows Lane just east of the Red Maple Swamp. It is still known as Samuel Bolles Road. A piece of this old roadway is traversed by the Thames Science Center Nature trail. Samuel

lived to the ripe old age of 98 and thus was still farming his property as recently as 133 years ago.

In 1659 James Rogers acquired the Mamacock Farm, which eventually comprised at least 425 acres, about two thirds of it, including Mamocoke Island, lying east of the road and the balance to the west. Portions of this



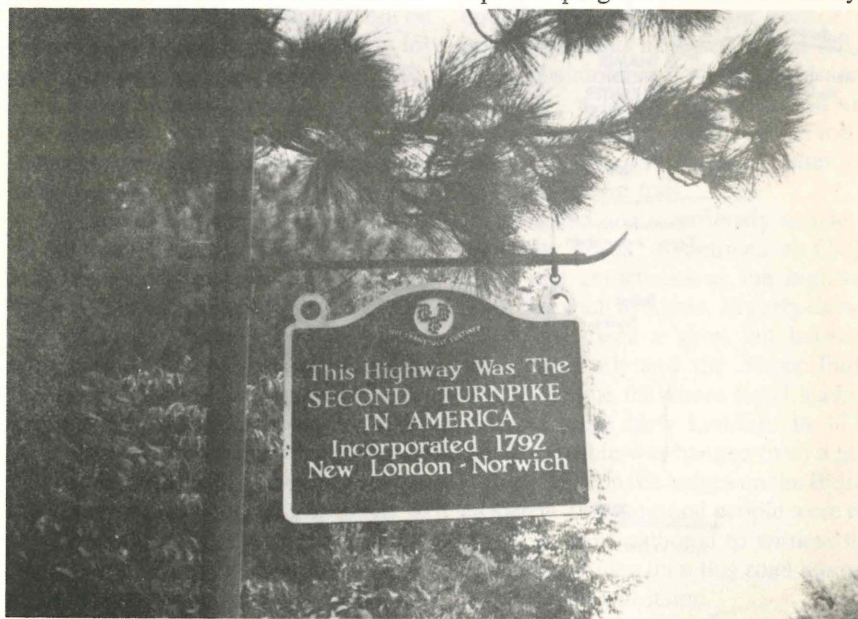
property remained in the hands of the family for seven generations. The twenty-two acre tract at the corner of Gallows Lane, within which the headquarters of the Thames Science Center is located, was the southwesternmost section of this holding. It was finally purchased by William Bolles, a great-grandson of John Bolles, in 1852). Nineteen years later it was sold to Jeremiah Calvert, whose dependents held the property until 1946. This land was probably actively farmed until the early part of this century; but by 1918 the owner had drawn up a plan for development, a portion of which, now known as College Court, materialized.

In 1945 this property came on the market and friends of the Connecticut Arboretum promoted its acquisition as an addition to the Arboretum. Their contributions accounted for about one-quarter of the \$4,000 purchase price. The western section was included in the Bolleswood Natural Area at the time of its establishment in 1952.

In 1968 Connecticut College received from the Thames Science Center

title to four acres of land contiguous to the northern boundary of the Connecticut Arboretum nearly a mile northwest of the present site of the Center; and in consideration for this gift, the Center obtained a 40-year lease of two acres on Gallows Lane, where its building was subsequently erected.

Citizens in southeastern Connecticut can experience the pleasures of a bit of wilderness in the midst of a growing metropolitan area because many generous people have cared enough about the environment to make this possible. Among them are members of the Bolles family, who preserved the Bolleswood; the Trustees of Connecticut College, who in 1931 established the Connecticut Arboretum; the many friends of the Arboretum who have over the years made it possible to add about 330 acres to the Arboretum and have contributed substantially to its maintenance; and members of the Thames Science Center whose contributions have made it possible for the Center to develop an interpretive program for the community.



DICK GOODWIN

by Josephine Merrill

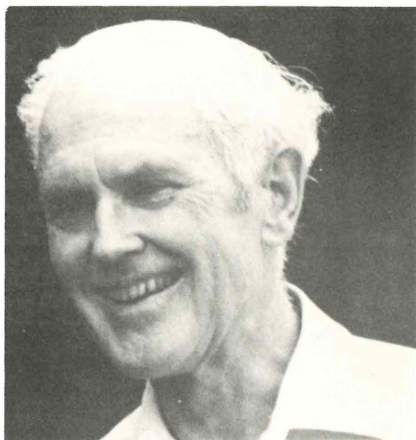
Imagine climbing Mount Kilimanjaro on your honeymoon! Dick and his wife, Esther, did. That's a hard act to follow, but the years since have not been without their share of adventure in the life of our writer on the inside story about Quaker Hill.

Historian of local land lore is only one of the hats he may assume. He might be described as author, botanist, educator, ecologist, environmentalist, adventurer, administrator, or world traveler. Perhaps human ecologist, however, fits him best.

He introduced and now directs the Human Ecology major at Connecticut College, where he has been Chairman of the Botany Department and Director of the Connecticut Arboretum. The background of his article comes from his intimate knowledge of the lands surrounding the College which he was instrumental in adding to Arboretum holdings over the years.

Dick's activities are wide and varied, but the thread connecting them all is that of concern for Spaceship Earth and its passengers. He is the new treasurer of the Board of Trustees of the Institute of Ecology, and president of the Conservation and Research Foundation. In 1974 he became the first president of the West Farms Land Trust in Waterford, of which he is now a trustee.

Formerly national president of The Nature Conservancy (1956-58 and 1964-66), he is now vice-president of its Connecticut chapter and resides in East Haddam adjacent to the Burnham Brook Preserve, whose 98 acres are now protected due to his efforts and generosity. Many other conservancy tracts across the United States have



been saved for the future through his foresight.

As executor of the estate of Mary Jobe Akeley (widow of the African explorer) who died in 1966, he implemented establishment of the Peace Sanctuary on her Mystic River property which Science Center members know so well. The Center was incalculably fortunate to have Dick as a member of its Board of Directors from its early days as the Children's Museum on Mohegan Avenue until 1969, when he became a Consultant to the Board. His guiding force and drive made our new building on Gallows Lane a reality rather than a dream. It is not too much to say we would not have it without his efforts.

An ardent tennis player, Dick also enjoys skiing and swimming when he is able to find time. An annual summer gathering at Squam Lake in New Hampshire brings Dick and Esther together with their family, including son Richard Jr., and daughter Minda and her two little girls.

Africa or Arboretum, a keen sense of empathy with his surroundings makes Dick always willing to share his appreciation with others. Because of this, those who know him think of him not in any of the roles he is so well fitted to fill but simply as a dear and wise friend.



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